

CURRENT PHASES OF HIGHWAY BUILDING AND MAINTENANCE

Address of Thos. H. MacDonald, Chief, U. S. Bureau of Public Roads, before the Seventeenth Annual Convention of the American Association of State Highway Officials, Salt Lake City, Utah, September 29, 1931

For two years public attention has been attracted to the possibilities of public and semi-public works to provide increased employment. Much of this attention has focused upon the building of public roads as one of the major activities. There has been much fantastic expectation and too many extreme remedies proposed for unemployment through this medium. A greatly exaggerated program of public works of sound and enduring value can not be turned on and off suddenly like water at a spigot, and any extreme attempts can only end in failure and waste, producing consequences worse than the situation sought to be cured.

The immediate situation of serious unemployment confronting the nation deserves the honest analysis and valuation of road building as a relief measure by the State and Federal highway officials in the light of the experience of the past two years.

In brief review, the first call of President Hoover to public officials and private agencies to undertake construction enterprises to the extent of their ability came in the fall of 1929. The response from the State highway departments generally was immediate. This newly faced responsibility fortunately happened to be timed with the availability of larger than normal funds in a number of States.

The Federal Government in April 1930, increased the funds for road aid by \$50,000,000, and on the first of September the Secretary of Agriculture apportioned to the States \$125,000,000 authorized for the succeeding year. Work proceeded at an accelerated pace. The year 1930 will be remembered as the most favorable construction season within recollection. Day after day peak production was possible because of continuously fair weather.

Removed-File Copy

From the standpoint of employment it is evident now that the rate of completion of projects was too rapid. By the end of the year many of the States had utilized the funds available and faced the new year 1931 with a depleted treasury. Since the State road funds come largely from the motor vehicle license fees and the month to month income from the gas tax, it was evident at the Pittsburgh November 1930 meeting of the Association that many of the States would be unable to use Federal aid funds available through the winter and early spring months because of lack of State funds to meet the legal requirements. This Association placed these facts before the Emergency Committee for Employment and finally before President Hoover, who met the situation by recommending an emergency advance of \$80,000,000 to be used in the place of State funds to meet the regular Federal aid funds already available. Congress acted promptly, and on December 20, 1930, the emergency legislation was approved. Work started almost immediately in the southern States, and due to the favorable winter and spring conditions, even in the northern States it was possible to carry on construction on a much larger scale than is ordinarily the case.

In five months the \$80,000,000 advance fund, together with \$160,000,000 regular Federal aid and State funds, totaling \$240,000,000, had been put under way on wholly new work to provide employment in all the States. The States also continued construction and maintenance programs from wholly State funds, and there were numerous uncompleted Federal aid projects carried over from the preceding year.

On the first of July the total going Federal aid program, including emergency and State funds, amounted to a total cost of about \$147,500,000, of which the total Federal share was \$275,250,000. Advice from the chief executives of the State highway departments agrees that the emergency fund for 1931 materially advanced the actual placing under way of work in the winter and spring months; provided for increased employment; enabled a number of States which were almost wholly without State funds to use the regular Federal aid funds available; and made it possible to hold the combined State programs, including Federal aid, at practically the same total of expenditure as for the preceding year. Had it not been for the \$80,000,000 emergency Federal appropriation for 1931 the total of the year's construction program would have fallen off by very much more than the amount of this fund,

for two reasons: first, a number of the States because of the accelerated program of the preceding year and for other causes, were not able to meet the regular Federal aid in full; and second, the proceeds of bond issues in a number of States, which had helped to swell the construction program for 1930, were exhausted.

The accelerated rate of placing Federal aid and emergency funds under construction is well illustrated by Charts Nos. 1 and 2.

In 1929 when the highway construction program was not being forced, it required the full 12-month period to obligate \$75,000,000 of Federal aid funds. In 1930, following the first demand to increase the rate of expenditure, this amount was obligated by July 10, six months earlier, but in 1931, \$75,000,000 of the combined regular Federal aid and emergency funds were obligated by March 1, and by May 30 approved projects to the amount of \$172,000,000 Federal aid and emergency funds were under way. This is the record only of new work. It does not include Federal aid projects previously placed under way but uncompleted, and does not include the State construction and maintenance program without Federal funds. Such a record of work placed under way, all on the basis of standard plans and specifications prepared by the State highway departments and approved by the Bureau of Public Roads, was only possible because of prepared and competent organizations already functioning.

Our current reports indicate that work was accomplished on the emergency projects by September 1 to absorb, with an inconsequential balance, the full amount of the emergency road appropriation.

Through the helpful cooperation of the States the number directly employed is definitely known. Starting with a total of 148,600 employed on the State and Federal highway programs in January 1931, there was a rapid increase as weather conditions permitted. In May the total passed 300,000, for July was 386,669, and the August preliminary figure is 384,000. Of the July total, 164,691 were employed on Federal and Federal aid projects, 112,681 on State and State aid construction, and 109,287 on maintenance.*

*None of this discussion includes any local road employment or expenditures by counties, townships or municipalities.

Certain characteristics of the highway work for the past two years are worthy of note. Increased employment has been provided when most needed. Expansion of road building is sound, since adequate highways have not been over-produced and are needed to a much greater extent. Increased construction has been accomplished without increased but rather with decreased unit prices. These lower unit prices, however, have not been at the expense of unskilled labor, generally speaking. There has been some advantage taken of the necessity for employment, but the average of prices reported for the unskilled labor rate of wage is holding close to the average paid in the States in previous years.

The best available figures for the years 1922 to 1931, inclusive, for the unskilled labor wage scale on concrete road projects show a maximum variation of 8 cents per hour between the high and the low annual figures, with the figure for the current year, 37 cents, an exact average of the high and low figures. During the same years there has been a marked decrease in the unit price per square yard for the pavement. That is, the cost of the product has been materially lowered without adversely affecting the wage scale for unskilled labor.

There is much misconception of road work as a medium for the direct relief of unemployment. Construction crews and maintenance forces are distributed generally over the State road systems during the normal working season and the popular mental picture seems to be that whole armies of additional men might be armed with pick and shovel and thus take up employment slack directly. Such is far from the case. There is, on the other hand, a lack of appreciation of the large number who indirectly participate in the distribution of road funds. Direct labor costs on the simplest grading work may run above 80 per cent of the total expended, but for the types of road which are being built to meet the actual needs of traffic the average payment to labor directly on the work would be between 20 and 30 per cent. This does not, however, represent the value of the road dollar to labor.

While it is exceedingly difficult to analyze, because of the wide variations in types of work and all other conditions, there is a very general agreement among highway executives that upwards of 85 per cent of the road dollar goes eventually for

labor and personnel employment. The road dollar spreads back through stone quarries, sand and gravel plants, cement factories, petroleum fields and refineries, mines, engages rail and water transport facilities, and keeps the wheels of equipment and accessory factories turning. Labor and personnel employment in all of these receives a part of the road dollar.

There are no intrinsically valuable raw materials which go into road work. The labor, manufacturing processes and transportation which determine the price of road materials, are largely made up of employment costs. This is particularly true at this time because road materials are selling at extremely low prices. There are highly competitive conditions, surplus supplies, and sacrifice of profits, to keep production going at reduced rates. On the basis of 80 to 85 per cent of the road dollar going eventually to labor, with 20 to 30 per cent expended as a general average for labor directly on the work, for each individual so employed, the total expenditures provides additional indirect employment equivalent to two other persons. This does not mean only two men actually employed indirectly, since production of materials and equipment and transportation may involve part time of many persons, but rather employment equivalent to full time for two other persons.

The July employment on the State and the Federal aid road programs, of 355,000 men directly, means a total of employment equivalent to around 1,155,000 people. May, June, July and August held reasonably near this amount of employment. For the remaining months there will necessarily be a considerable drop.

With the funds now in prospect it will not be possible to maintain the accelerated rate of the State highway work for the coming year which has prevailed for the past two years. But with a spirit to meet the situation, there is assurance now of a large, if not a maximum, employment program for the coming year.

It is time to make plans for the coming year in the light of the experience particularly of the two years behind us. Many kinds of proposals are being submitted to the Bureau by the States to write restrictive conditions relating to employment into the contracts for Federal Aid projects. In the effort to offer maximum employment, but at the same time to protect labor from exploitation, some fundamental restrictions

appear necessary, and the Bureau will accept certain policies which are sincerely proposed to increase and to protect labor.

Under the immediately existing conditions, expediting the completion of projects is not so much the objective as providing the maximum opportunity possible to absorb labor.

Private industry, as a means for increasing the number given partial employment, is restricting hours per day and days per week. By staggering employment more individuals receive at least a living wage.

Road work does not offer quite the same possibilities particularly in the vicinity of the larger cities where unemployment is the most acute, but some such plan can be worked out, and it would be entirely feasible to let more projects and restrict the hours per day and the days per week, such as an eight-hour day and a five-day week. This would carry the work over a longer period for the same total expenditure.

The Bureau will therefore approve stipulations along the following lines:

First, the fixing of a fair minimum wage scale for unskilled labor only; but this should be written into the tenders and contracts of the contractors. There must be a recognition on the part of the States of the fair differentials existing between the States and between sections of the same State, and no attempt made to increase a fair rate for this type of labor under normal conditions. The rates of pay during former years have been reported so that we know from existing records actual facts as to wage scales wherever Federal aid projects have been built.

Second, an acceptable restriction to give preference to local unskilled labor and to residents of the State, availability and other conditions being equal. This does not apply to the skilled mechanics and equipment operators who form the nucleus of the contractor's organization.

Third, if legal in the State, the Bureau will participate with the State on a day labor or force account basis on small projects only where such projects can be used as the means to provide quick local employment with reasonable economy and which do not require the establishment of camps or too long

transportation to the work. This does not mean in any way a breakdown of the contract system or apply to more than a very limited percentage of the Federal road funds available. It is to be strictly construed as a possible emergency method of relieving acute local unemployment conditions in the winter and spring months. On such projects Federal aid allowances will not be made for rentals of machinery or State owned equipment.

Fourth, a restriction as to hours per day and days per week that unskilled labor may be continuously employed on any project, that is a provision or policy of intermittent employment.

Fifth, the Bureau will approve the reopening of projects completed if Federal aid balance is available within the maximum mileage allowance to place large sized drain pipe in roadside ditches which are eroding, the trenches to be back-filled with porous materials and the ditches obliterated to the extent possible, and other betterments which are advisable construction and improve the safety of the road.

Sixth, a restriction which the Bureau will not accept is any disbarment of a contractor from the award of a contract because he is a non-resident of the State, provided he is the lowest responsible bidder. The Federal Government consistently maintains the principle of the award of contracts to the lowest responsible bidder, and this is the only defensible public policy. The Bureau is an exponent of the prequalification of bidders, and attaches major importance to the term "responsible."

Seventh, the Bureau will not accept restriction or limitation to materials, etc. produced only within the State.

As a further move on the part of the Federal Government, I am authorized to state that the allocation of the 1933 funds to the States will be made as of October 15.

While the employment situation must now be given first consideration in the road improvement program, there are important phases which must be given concurrent attention. The construction programs are in general being accomplished with constantly higher standards both of design and construction. Researches extending to sub-soils, the proportioning of materials, efficiency and rates of production, are the methods by which resultant higher quality and lowered costs have been made possible.

During the period since its inception in 1916, Federal aid funds have been directed to the extension of highway facilities. Road mileage added by types is as follows:

Federal Aid Roads Improved by Types as of June 30, 1931

Type	Mileage
Graded and drained	11,348
Sand-clay (treated and untreated)	7,374
Gravel (treated and untreated)	29,256
Macadam (treated and untreated)	2,345
Low-cost bituminous mix	1,574
Bituminous macadam	4,196
Bituminous concrete	3,427
Portland cement concrete	28,010
Block	993
Bridges and Approaches	390
Total - - - - -	88,713

More than 51,000 out of 88,000 miles have been of the pioneer type, carrying surfacings of lower type than bituminous macadam.

The rapid extension of surfaced highways available throughout the year, and the increased motor vehicles in operation, have produced a constantly growing income by way of gasoline and motor vehicle license taxes from the use of the roads themselves.

Registration Motor Vehicles

Type	1921	1925	1930
Passenger cars and taxis <u>1/</u>	9,473,391	17,457,638	22,950,340
Busses <u>2/</u>	10,000	53,000	92,500
Trucks	979,904	2,441,709	3,480,939
	10,463,295	19,952,347	26,523,779

1/ Bureau figure for passenger cars, taxis and busses with number of busses, as reported by Bus Facts, deducted.

2/ As reported by Bus Facts.

The growth of the income is shown by the following:

	1921	1925	1930
Gas Tax	\$ 5,302,260	\$146,028,940	\$493,865,117
Auto License	(122,478,654)	161,574,729	275,406,545
Chauffeur License	()	6,994,219	17,680,898
	\$127,780,914	\$314,597,898	\$786,952,560

There are six States which have completed to a satisfactory point the original seven per cent Federal aid system, and others will soon qualify. The States, in addition to work on a constantly enlarging State system, are in many instances contributing to the building of State aid or local roads, either through funds controlled by the State highway department, or by funds allocated directly to the county from the road user income. Only in the policy of completion of the roads in the order of their traffic importance lies the certainty of help in building the local or farm roads.

From recent studies of the road income in Wisconsin, which has important manufacturing as well as large agricultural interests, it is evident that a major contribution is being made to the building of rural roads by the residents of cities and towns through the use of gas taxes. This condition will without doubt be found to exist in all of the States, and it will soon mean a division of road user income to streets within municipalities where this has not already taken place. This division is not to be taken as an unfair or an unwise diversion if provision is made for the control of the fund under direction or supervision of the State highway department on the streets of general traffic use or which provide additional facilities for the relief of traffic congestion within the municipal or metropolitan areas.

For nearly ten years road building has been a major public improvement activity, made necessary but also made possible largely by the increase in the utilization of motor vehicles. During this period the number of motor vehicles has not only increased from ten and one-half to twenty-six and one-half millions, but the use of the individual vehicle has materially increased. In the past five years the apparent consumption of gasoline per year per vehicle has increased from 444 gallons to 556 gallons. No attempt is made to evaluate this in terms of increased mileage, since probably the consumption of gasoline by the individual vehicles has tended to increase because of design, while at the same time the consumption has tended to decrease because of the improved road conditions.

Such a tremendous increase in the number of all types of motor vehicles which have proved themselves so adaptable to an extremely wide range of utilization could not but produce tremendous impacts on our social and economic life. Within the past five years the ratio of trucks and busses to total cars in operation has changed but little, and there is no evidence of an abnormal growth of either of these types. The volume of truck traffic in the east, where transport surveys are available, ranges around 10 per cent, while in the western States' survey it increased to 16 per cent. This is to be expected because of various apparent conditions.

Almost the whole of our knowledge of the effect of motor vehicles upon improved roads as structures has come within the 10-year period, and perhaps the most important development so far as the movement of heavier vehicles is concerned is the sudden change to the use of high-pressure pneumatic and balloon tires by a large percentage of the heavier vehicles. The effect of this change upon the rate of depreciation and maintenance costs of our highways in the future will be very large. The development of these pneumatic tires capable of giving reliable service under heavy loads is a development of which the tire manufacturers of the country well may be proud. This development is changing the designs of the heavier vehicles so that we come now to the point where we can well agree upon legally permissible wheel loads which will be of universal application. The same uniformity can be applied to other regulations of vehicle operation, thus stabilizing and perfecting our use of motor transportation facilities.

Within the year researches ought to be concluded or brought to a point where they supply the still missing information sufficient to place the regulation of the heavier vehicles on a sound basis with relation to road design, construction and maintenance.

Contrary to the popular impression, the concentrated loadings of motor vehicles which may legally be used on our highways are not increased over the loads which were provided for prior to the advent of a single motor truck or bus.

The specifications for the early macadam roads of this country generally provided that a ten or fifteen-ton road roller, with two-thirds of the weight on the rear axle, should be used.

The report of the Massachusetts Highway Commission for 1893 carries wheel loads per inch width of tire as high as 1600 pounds on wagons in actual use.

The narrow-tired farm wagons of the agricultural districts and the wider-tired but heavier vehicles in common use in the cities provided a maximum destructive effect on road surfaces. The problem of the engineer until the advent of the pneumatic tire had been to find a surface that would stand up under the constant grinding of steel-tired heavily loaded vehicles. The rounded granite cobbles of many city streets still bear mute testimony to the tremendously destructive effect of this traffic. We have nothing even approaching the destructive effect of such traffic today on road surfaces.

Traction tests in Iowa in 1905 required as high as 400 to 500 pounds pull per ton to move a narrow-tired farm wagon on earth roads in the spring. This means that the tire was literally being pulled through, rather than on, the surface of the road.

Even the use of the solid rubber tire should be discontinued except for special conditions where the pneumatic will not serve.

But this is the engineering side of the problem. The obtaining of uniform regulations as to use may be more difficult since there are two important classes of interests to satisfy: first, the public, which is concerned with its own use of the passenger automobile, and which comprises 90 per cent of the traffic, and second, the utility organizations which supply other forms of transportation, particularly the railroads.

From a few of the railroads there have been vigorous claims of unfair competition of the commercial motor vehicle. By and large, the regulation of the use of the larger motor vehicles on the highway is going to be determined by the attitude of the passenger automobile using public, although such

regulation may be to an extent promoted and in some details determined by the other interests. We must secure a harmony of operation between the private automobile and the public and private bus or truck. The controversy over common carrier and particularly interstate common carrier movements, whether of passengers or commodities, is a small and incidental part of the whole highway transport utilization, and while regulation may restrict the type of movement, this does not and probably will not remove the traffic itself from the highways. The thought should be given first consideration, in any move to suppress, severely restrict or make unnecessarily expensive the operation of the common carrier, bus or truck, that it is the small shipper and the man or family financially unable to operate individual cars or trucks that must suffer the loss of highway transportation. Thus appears again the necessity for the coordination of transportation facilities, about which much has already appeared, and in which certain movements are taking place, but which needs to be stimulated by official and legal action.

In an earlier paper before this Association I suggested the formation of a national transportation board to develop the basic facts upon which harmonious and economic action might be taken. Such a board should be composed of all the agencies of the Federal Government having to do with transportation. This does not contemplate a new agency, but provides a clearing-house through which the facts might be brought together and made available for the legislative bodies and executives of the nation. I believe this to be an even more important need now.

There has already developed friction over the matter of highway vehicle movements between States. At present in 9 States full reciprocity is granted for all vehicles, in 20 for all except those operated for hire, in 17 except those operated for hire and privately operated commercial vehicles, and in 3 except those carrying passengers for hire. The tendency against full reciprocity for the movement of vehicles operating inter-state is wrong in principle. Given uniformity of regulation as to the sizes, weights, financial responsibility, and all other details which would go to make up a specification for a desirable public operation, there ought to be full reciprocity granted between States. No objection could be

raised to the division of the fees imposed in payment for doing business on the public highways between States affected. This would be fair. But more serious burdens or restrictions ought not be imposed on either privately or publicly owned vehicles because the freedom of inter-state commerce and the proper regulation is of supreme economic importance.

One of the principal objectives of the Federal Highway Act is to develop continuity of communication over the roads between the States, and any unnecessarily restrictive or retaliatory measures would tend to break down the very interest which is sought to be served by the Federal contribution.

These are administrative questions which become more and more intricate, but which can be solved by a proper spirit of fairness and an honest facing of the facts.

It has been urged that the heavier vehicles do not pay a fair portion of the cost of road building and upkeep. In general, this is not true, although there may be specific cases in which it is a fact.

A study in Pennsylvania indicates that only a small mileage of the total highway system is used by the heavier vehicles. Notwithstanding this, there is now being collected through gas and license fees from the various classes of heavier vehicles, a sum very closely approximating any increased cost of road construction which may be reasonably charged against the increased strength requirements of the heavier loads over the whole system.

Reserved for last mention is perhaps the most important of all, that is, the promotion of safety on the highways. We can not say that sufficient steps are being taken by the highway organizations and by other public officials to secure safety, particularly of persons, so long as we have the alarming totals of serious and fatal accidents annually. I hope to see the States undertake as a major problem and activity, measures that will deal effectively with this issue, and in this movement, so far as I am able, I pledge the cooperation and active assistance of the Bureau of Public Roads. It is a

problem so big that no one agency can hope to effect any considerable change, but through the coordinated efforts of all agencies constantly alert, real progress can be made.

Progress is already being made. One of the most encouraging thoughts of this most serious problem is that the ratio of child fatalities has shown a marked decrease to the total of fatal accidents.

In closing I wish to express for the whole organization of the Bureau of Public Roads, Washington and field, not alone our thanks for the friendly spirit of our contacts, but more important, our increased admiration for and confidence in, the personnel of the State highway departments, growing out of the handling of the greatly accelerated cooperative road programs of this year.

CHART NO. 1

JAN 1 JAN 31 FEB 28 MAR 31 APR 30 MAY 30 JUNE 30 JULY 31 AUG 31 SEPT 30 OCT 31 NOV 30 DEC 31

MILLION DOLLARS

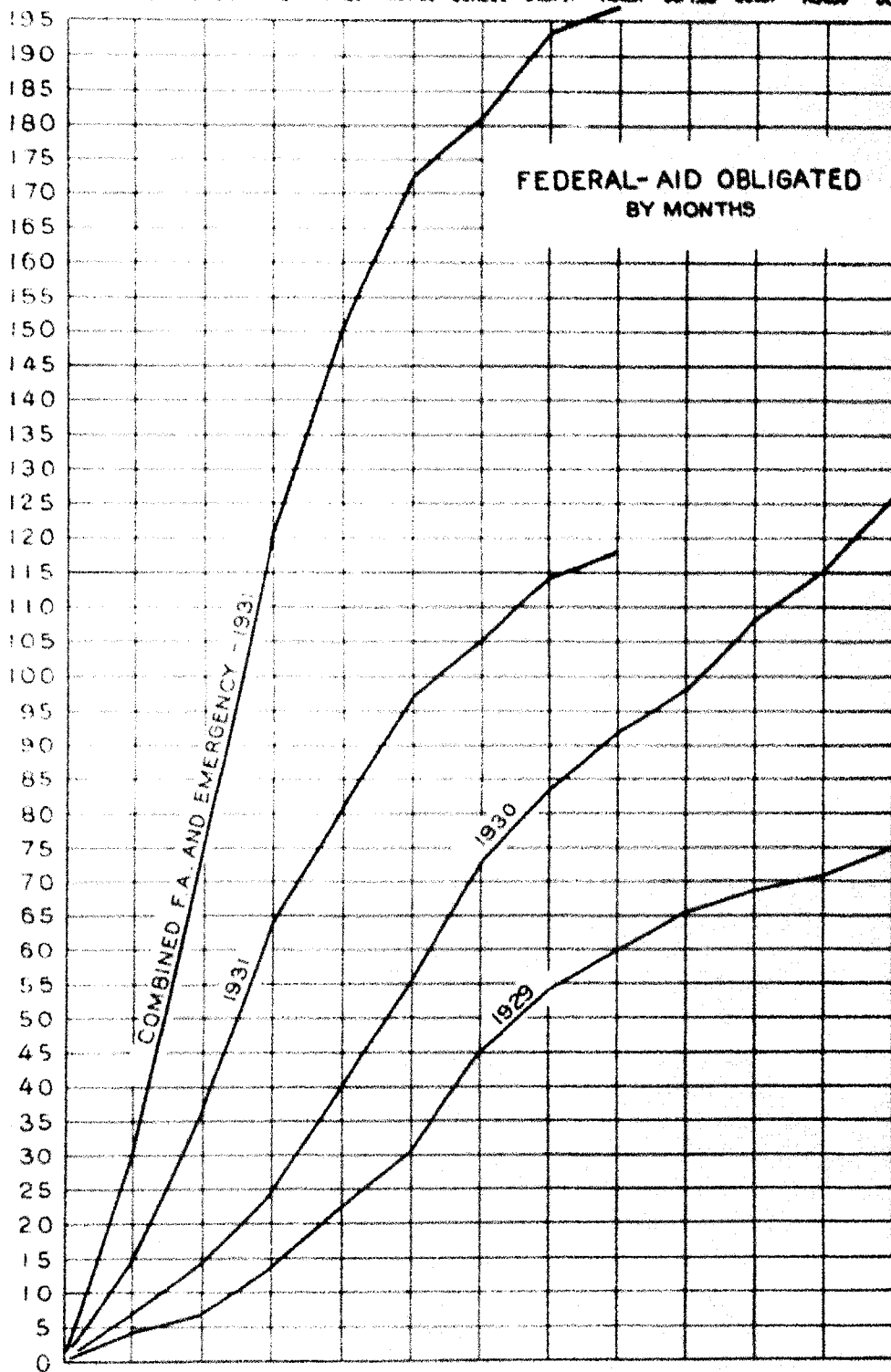


Chart No. 2. - Earnings of Federal Funds Indicative of Actual Employment.

